

5G and Cloud Interoperability for Smart Grids

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Smart Metering Communication Requirements and Experiences

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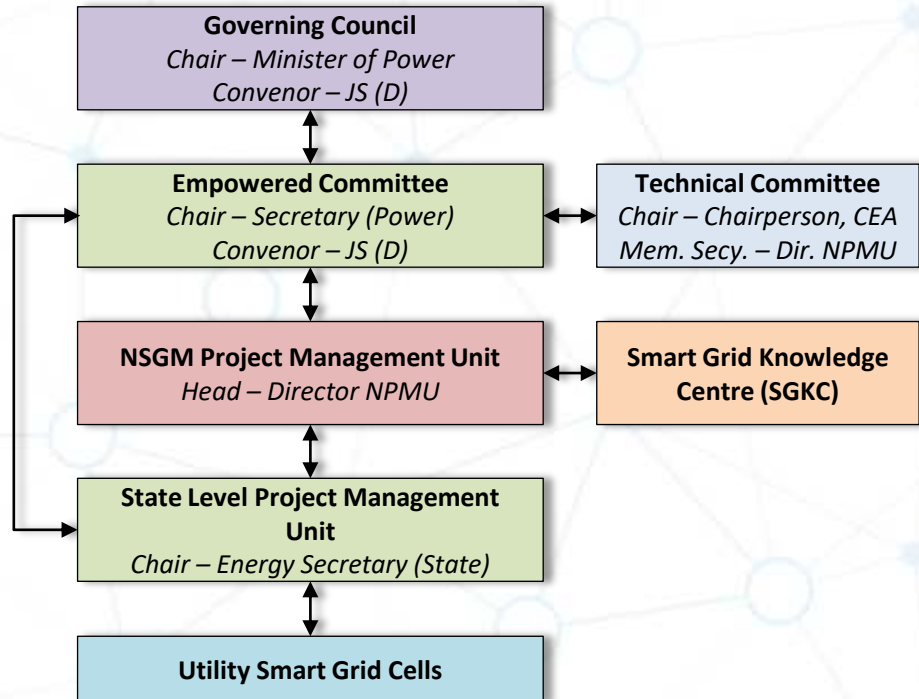
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Presentation Flow

- National Smart Grid Mission, Objectives and Achievements
- Smart Grid Projects and Pilots in India
- Smart Metering Communication Requirements
- Smart Metering Communication Experiences
- Smart Metering Communication Expectations
- Learnings from Pilot Projects

National Smart Grid Mission

NSGM has been established in March 2015 with institutional framework as follows:



Bilingual website
www.nsgm.gov.in/en
www.nsgm.gov.in/hi

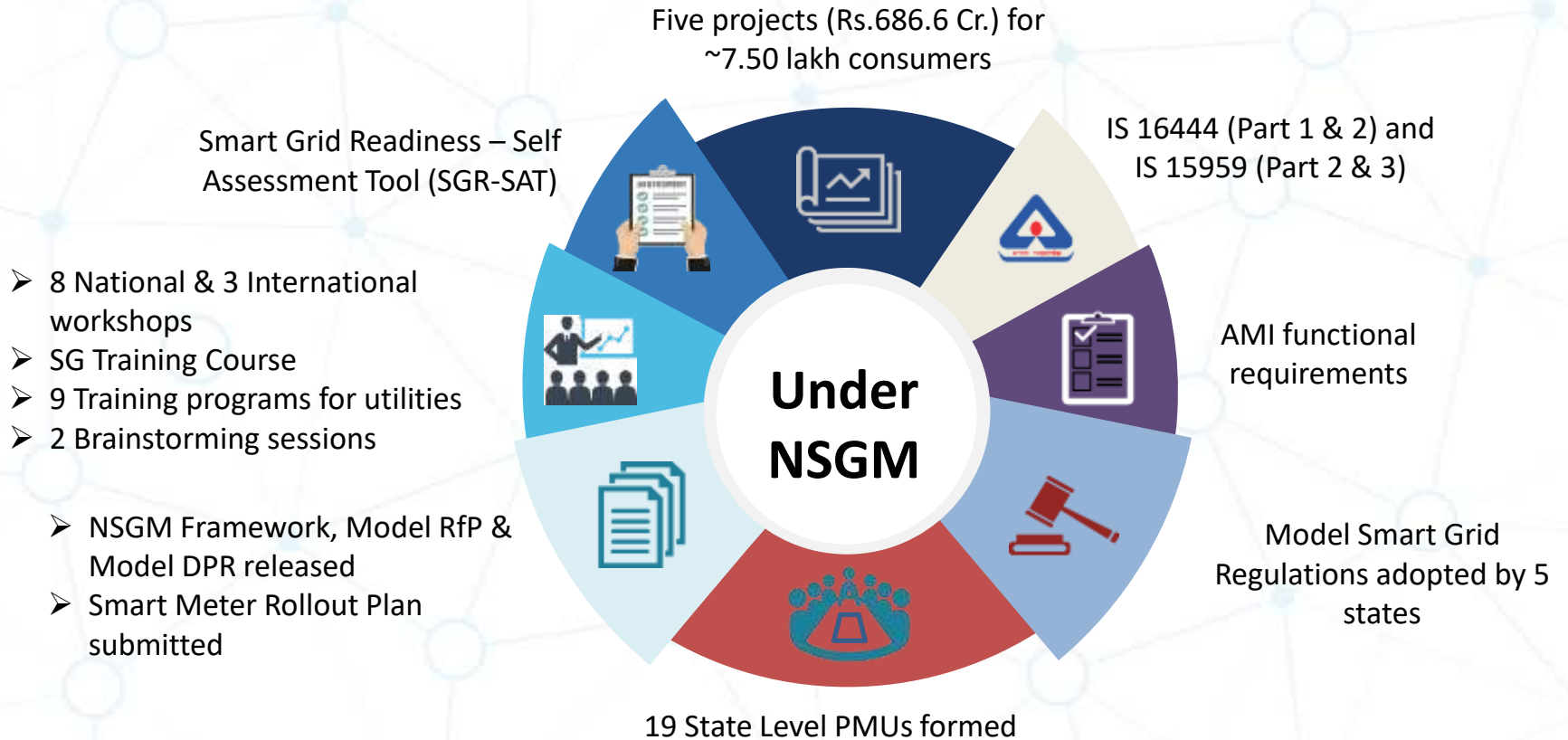
NSGM Objectives

- Bringing in development of Smart Grids:
 - Enable access and availability of quality power to all
 - AMI roll out, prosumer enablement, Demand Response (DR)/Demand Side Management (DSM)
 - Policies and tariffs – Dynamic tariff implementation, DR programs, tariff mechanisms for solar PVs
 - Renewable integration – Green power and energy efficiency
 - Electric vehicles (EV) and energy storage – EV charging stations & energy storage systems
 - Loss reduction
- Capacity building – utilities and regulators
- Technical cooperation, research and collaboration with national and international development partners like ISGAN, USAID, DFID, NEDO, KfW, World Bank, ADB etc.
- Facilitate consumer awareness etc.

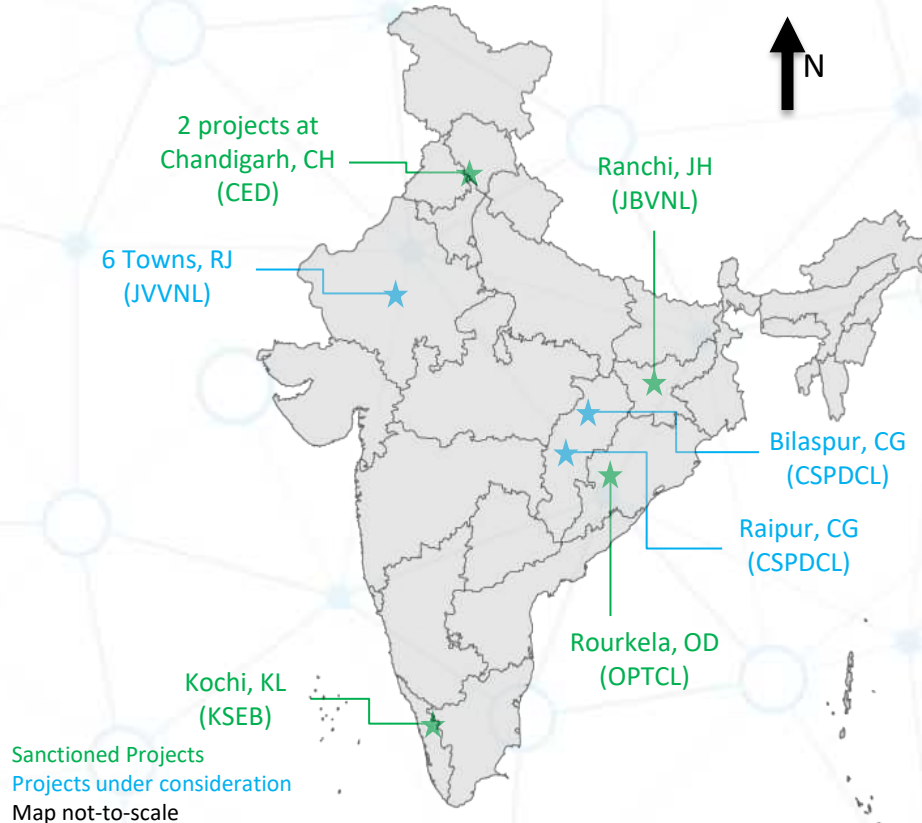
NSGM Goals

Goals Relating to Smart Grid Rollout	Phase I	Phase II
	Up to 2020	2020-2025
1. SLPMU - actions (number, percentage of utilities taking action)		
1.1 SLPMU units	100 %	
1.2 Smart Grid regulations	100 %	
1.3 Smart Grid roadmap formulation		100 %
2. Smart Grid - utility level actions (number/percentage of utilities taking action)		
2.1 Smart Grid Cell formation by utilities	100 %	
2.2 Smart Grid Roadmap preparation by utilities		100 %
3. Utility preparedness (Number of utilities with target maturity level, total number of utilities)		
3.1 Preparation of Maturity level framework	By 2020	
3.2 Assessment of Utilities as per Finalized Framework	100 %	
4. AMI		
4.1 Utility's having AMI experience	10	100 %
4.2 AMI rollout in all towns	25 number	100 %
5. Network mapping and consumer indexing		
5.1 Number of utilities with network mapping and consumer indexing (live and updated)	100 % (Urban)	100 % (Rural)
6. Distribution automation		
6.1 Distribution automation (SCADA/DMS)in Urban census towns with population as per IPDS		100 %
7. Microgrid and renewable integration		
7.1 Utilities with institutional capabilities to manage renewable integration	10	100 %
7.2 Utilities having the technological capabilities to manage local generation and microgrid projects	10	100 %
8. Electric Vehicles		
8.1 Utilities with technological capabilities to deploy EV Infrastructure	10	100 %

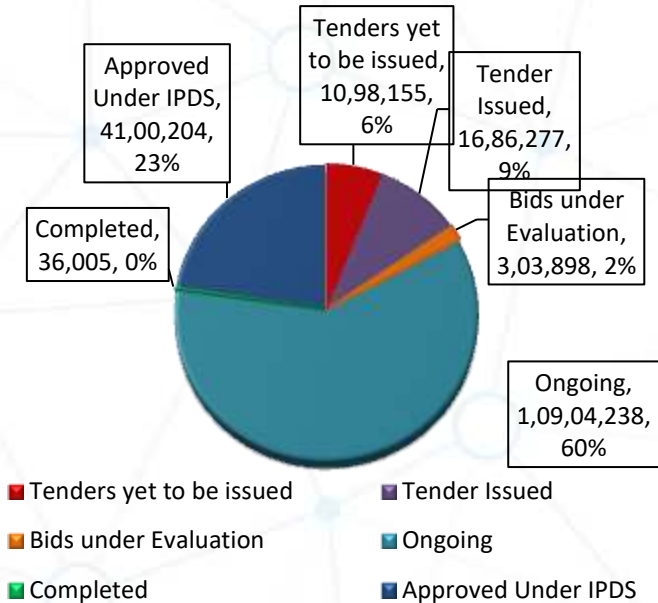
NSGM Achievements



Smart Grid Projects under NSGM



Smart Metering – National Scenario



Smart Grid Pilot Projects

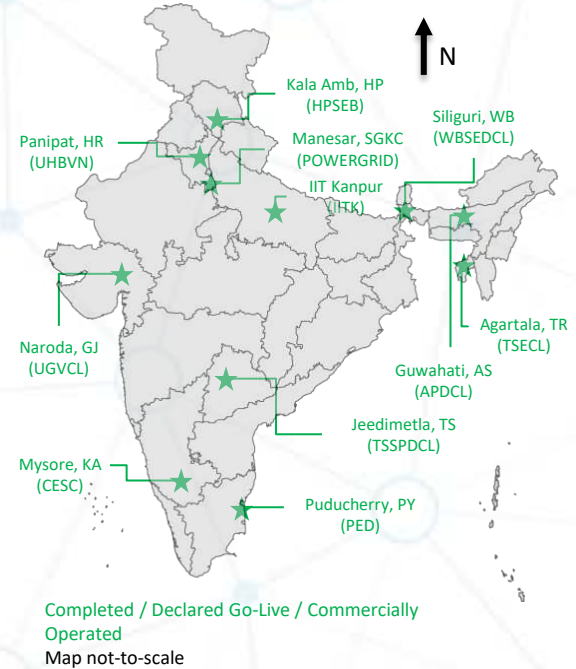
Impact assessment activity under progress



All pilots declared go-live / completed / commercially operated

~1.6 lakh Smart Meters installed

11 pilots including SGKC



Metering Standards

Sl.	Standard	Description	Year
1	IS 15884	Static Prepaid Meters	2010
2	IS 15959 (P1)	Data Exchange for Static Electricity Meter	2011
3	IS 13779 Reaffirmed	Static Meters	2014
4	IS 16444 (P1)	Whole Current Smart Meters	2015
5	IS 15959 (P2)	Data Exchange for Smart Meter	2016
6	IS 16444 (P2)	Transformer Operated Smart Meters	2017
7	IS 16444 (P1) Amend-1	Whole Current Smart Meters	2017
8	IS 15959 (P1) Amend-4	Data Exchange for Static Electricity Meter	2017
9	IS 15959 (P2) Amend-1	Data Exchange for Smart Meter	2017
10	IS 15959 (P3)	Data Exchange for Transformer Operated Smart Meter	2017

Testing Facilities

- 4 labs ready for testing smart meters as per IS 16444-Part 1:
 - CPRI, Bengaluru
 - CPRI, Bhopal
 - ERDA, Vadodara
 - YMPL, Udaipur
- Total capacity assessed to be approx. 300 models/makes per year
- CPRI Bengaluru ready for testing smart meters as per IS 16444-Part 2
 - Other labs are expected to be ready with IS 16444- Part 2 also shortly
- Labs to ensure expediting the process of setting up upcoming facilities
- BIS process for granting of certification to meter manufacturers after type test at the accredited labs needs to be streamlined

Smart Metering Communication Requirements

- Communication is major component of AMI which should be/provide
 - Reliable (near-to-no data loss, push/pull etc.)
 - Secure (access control, authorization, protection, network hardening etc.)
 - Efficient (always on, low power, >99.9% agreed SLA data etc.)
 - Robust (network management, configurations, auto discovery etc.)
 - Low latency (no delay response/handshake/work closure etc.)
 - Two way (bi-directional etc.)
 - Seamless integration and data exchange
 - Based on suitable standards from ITU / IEC / IEEE / CEN / ETSI / CENELEC
- Backbone to bridge existing and newer infra
- Requirements vary for various communication technologies like PLC, RF, Cellular
- Dependable on site conditions
- Should deal with technology obsolescence (easy upgradation to latest flavors)

Smart Metering Communication Experiences

- Pilot projects tested various communication technologies for geographical conditions
- Produced mixed results: ranging from 95% to 99% data availability
- Seen improved performance based on RF mesh developed & deployed at Mysore SG Pilot
- Undue doubt on PLC technology was negated which performed well in Tripura SG Pilot
- Smart meters with combination of RF/PLC/GPRS modules deployed at Haryana SG Pilot
- Configurations seen in SG pilots
 - DCU based
 - Meter to DCU – RF/PLC
 - DCU to Control Center – GPRS
 - Non DCU based
 - Meter to Control Center – GPRS
- Delayed command executions – due to network latency / poor coverage/configuration

Smart Metering Communication Expectations

- No loss of data and nil-to-low latency
- No interruptions in operations
- No dependency on licensed or free bands
- Low power and ability to connect more devices
- Agreed SLAs (>99.9%)
- Indian specific standards
- Cost efficient and lower maintenance
- Better quality of service
- Self healing and auto discovery
- Lower dependency on network provider for configurations
- Technology Neutral Solutions- RF/GPRS/PLC/NB IoT/5G etc

Learnings from Pilots/Projects

Where We Started

- No standards or specifications
- Legacy and non performing systems
- Communication
 - PLC – not so reliable
 - RF – very little market penetration
 - GPRS – higher charges
- Business-as-usual practices
- No availability of data

Where We Stand Now

- IS 16444 and companion standards for Smart Meters
- Newer IT solutions and integration facilities
- Communication
 - PLC – Dependable results
 - RF – canopy and mesh based
 - GPRS – arbitration for interoperability
- Process redesign, change management etc.
- Analytics and various services

Thank you